In the United States Court of Federal Claims

No. 11-201C
Filed: November 2, 2020
Refiled: November 17, 2020

ROSS-HIME DESIGNS, INC.,

***Plaintiff*,**

v.

THE UNITED STATES,

***Defendant*.**

Keywords: Patent; Non-Infringement; RCFC 56; *Mas-Hamilton Grp. v. LaGard, Inc.*, 156 F.3d 1206 (Fed. Cir. 1998); *Celotex Corp. v. Catrett*, 477 U.S. 317 (1986); Doctrine of Equivalents; Anticipation; 35 U.S.C. § 112.

Vytas M. Rimas, Rimas Law Firm, PLLC, Minnetonka, MN, for Plaintiff.

Conrad J. DeWitte, Jr., Assistant Director, Commercial Litigation Branch, Civil Division, U.S. Department of Justice, Washington, DC, with whom were *Joshua Miller*, Of Counsel, *Gary L. Hausken*, Director, Commercial Litigation Branch, U.S. Department of Justice, *Joseph H. Hunt*, Assistant Attorney General, and *Kurt Hammerle*, Of Counsel, Office of the Chief Counsel, NASA Johnson Space Center, for Defendant.

MEMORANDUM OPINION AND ORDER
GRANTING SUMMARY JUDGMENT

TAPP, Judge.[1]

Before the Court in this patent infringement case is the United States' Motion for Summary Judgment. (Def.'s Mot. for Summ. J., ECF No. 309 ("Def.'s Mot.")). In this action, Plaintiff, Ross-Hime Designs, Inc. ("Ross-Hime"), alleges that the National Aeronautics and Space Administration ("NASA") infringed on two of Ross-Hime's patents for robotic, hand-like manipulators—U.S. Patent Nos. 5,967,580 (the '580 Patent) and 6,658,962 (the '962 Patent) (collectively, the "patents-in-suit")[2]—through NASA's use and manufacture of two anthropomorphic robotics systems, designated Robonaut 1 and Robonaut 2.[3] (*See generally*,

[1] This case was originally assigned to then-Chief Judge Emily Hewitt, reassigned to Judge Mary Ellen Coster Williams in 2013, (*see* ECF No. 79), and reassigned to Judge David A. Tapp on December 3, 2019 (ECF No. 304).

[2] A copy of the '580 Patent is found in Exhibit 1 of the Complaint. A copy of the '962 Patent is found in Exhibit 2 of the Complaint.

[3] NASA created two iterations of Robonaut 1, designated Robonaut 1A and Robonaut 1B. On September 19, 2018, the Court dismissed the claims relating to Robonaut 1B as time-barred. (*See* ECF No. 287). For clarity, the Court will refer to Robonaut 1A as simply "Robonaut 1."

Compl., ECF No. 1). Ross-Hime asserts that Robonaut 1 infringes on Claim 5 of the '580 Patent, that Robonaut 2 infringes on Claims 1, 5, 14, and 15 of the '580 Patent, and that Robonaut 2 infringes on Claims 11 and 14 of the '962 Patent. (Def.'s Mot., Ex. C (Ross-Hime's March 14, 2017 Infringement Claim Chart), Ex. D (email from Pl.'s counsel to Def.'s counsel regarding Ross-Hime's March 14, 2017 Amended Infringement Claim Chart)).

On April 29, 2016, the Court issued a decision, pursuant to *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 372–74 (1996), construing the disputed terms in the patents-in-suit. *See Ross-Hime Designs, Inc. v. United States*, 126 Fed. Cl. 299 (Apr. 29, 2019) (ECF No. 205). Particularly relevant to the present motion, the Court determined that the term "linear actuator," which is used in all the asserted claims, would be understood by a person of ordinary skill in the art to mean "a device, with ends defined by a base piece and an extending piece, that converts some kind of power into linear motion such that the extending piece moves in a straight line relative to the base piece."[4] *Id.* at 321. The Court was explicit that the term does not include "'specialized' or 'converted end' linear actuators because these 'specialized' features are also separate structures, such as . . . flexible tape." *Id.* Based on this construction, the United States asserts Ross-Hime cannot prove that either Robonaut 1 or Robonaut 2 meets every limitation of the asserted claims. In addition, the United States argues that Claim 11 of the '926 Patent is anticipated by U.S. Patent No. 4,367,891 (Wauer). For the reasons set forth below, the Court agrees that Ross-Hime cannot prove that NASA infringed on the '580 or '962 Patents and, therefore, **GRANTS** summary judgment in favor of the United States.

I. Background

Ross-Hime is a Minnesota corporation specializing in the design of humanoid robotic systems, including robotic manipulators, and is the assignee of the patents-in-suit. (Compl. at 1–2, ECF No. 1). The inventions disclosed in the patents-in-suit relate to anthropomorphic robotic manipulators, which mimic movements being performed by a human operator. *Ross-Hime Designs*, 126 Fed. Cl. at 301.

A. The '580 Patent

The invention disclosed in the '580 Patent "relates to controlled motion mechanical members used as a mechanical manipulator and, more particularly, to a motion controllable, anthropomorphic mechanical manipulator providing some of the capabilities of an upper human torso." '580 Patent 1:8–12. Ross-Hime asserts that NASA infringed on independent Claims 1 and 5 of the '580 Patent, and dependent Claims 14 and 15, both of which depend from Claim 1. (Compl. at 2–3, Ex. 1; Def.'s Mot., Exs. C, D, F, G). Specifically, Ross-Hime asserts that Robonaut 1 infringes on Claim 5 of the '580 Patent, and that Robonaut 2 infringes on Claims 1, 5, 14, and 15 of the '580 Patent. (*See* Def.'s Mot., Exs. C, D, F, G).

The asserted claims of the '580 Patent aim to robotically simulate a gripping mechanism, and describe various actuators using differential movement to achieve the dexterous motion of a

[4] The Court determined that a person of ordinary skill in the art is "someone with a Bachelor's degree, or equivalent, in mechanical engineering with a minimum of two years of experience following graduation, including work with mechanisms." *Ross-Hime Designs*, 126 Fed. Cl. at 314.

thumb and forefinger and grasping motion of a human palm. Claim 1 of the '580 Patent is illustrative and teaches:

> **1.** An articulated manipulating system for mounting on a base in a robotic manipulator and capable of engaging selected objects, said system comprising:
>
> a support frame having a base support for mounting on said base with said base support having a first frame extension so as to extend therefrom in a first direction and a second frame extension rotatable connected to said base support and extending therefrom in a second direction at an angle to said first direction;
>
> a first effector base rotatably connected to said first frame extension so as to be rotatable with respect thereto in plural different directions;
>
> a second effector base rotatable connected to said second frame extension so as to be rotatable with respect thereto in plural different directions;
>
> first pair of base linear actuators each having an end thereof rotatably connected to said first frame extension at corresponding extension connection locations thereon, and each having that opposite end thereof rotatably connected to said first effector base at corresponding effector connection locations thereon so that any substantial differentials in movement of these actuators cause corresponding substantial motions of said first effector base towards a corresponding one of said extension connection locations and so that substantial common movements of these actuators causes substantial motions of said first said effector toward or away from both of said extension connection locations; and
>
> a second pair of base linear actuators each having an end thereof rotatable connected to said second frame extension at corresponding extension connection locations thereon, and each having that opposite end thereof rotatably connected to said second effector base at corresponding effector connections locations thereon.

'580 Patent 27:42-28:9.

Claim 14 depends from Claim 1 and states:

> **14.** The apparatus of claim **1** wherein said first pair of base linear actuators are rotatably connected to said first effector base as aforesaid so as to be also on a further common side thereof.

'580 Patent 30:31–30:34.

Claim 15 of the '580 Patent depends from Claim 14 and, in turn, Claim 1, and provides:

> **15.** The apparatus of claim **14** wherein said first pair of base linear actuators are rotatably connected to said first frame extension as aforesaid on either side of where said first effector base is rotatably connected thereto.

'580 Patent 30:35–30:38.

Claim 5 of the '580 Patent is similar to Claim 1 and teaches:

> **5.** An articulated manipulating system for mounting on a base in a robotic manipulator and capable of engaging selected objects, said system comprising:
>
> a support frame having a base support with a first frame extension so as to extend therefrom in a first direction, a base arrangement for mounting on said base comprising an output effector being rotatably mounted in a drive housing, said drive housing having a pair of housing sectorial frames affixed thereto, each having a bearing race following a circular arc therein for holding corresponding ball bearings against a corresponding bearing race following a circular arc in a corresponding one of a pair of housing sectorial mounts affixed to a support standard to result in said drive housing being rotatably connected to said support standard;
>
> a first effector base rotatably connected to said first frame extension so as to be rotatable with respect thereto in plural different directions; and
>
> a first pair of base linear actuators each having an end thereof rotatable connected to said first frame extension at corresponding extension connection locations thereon, and each having that opposite end thereof rotatably connected to said first effector base at corresponding effector connection locations thereon so that any substantial differentials in movement of these actuators cause corresponding substantial motions of said first effector base towards a corresponding one of said extension connection locations and so that substantial common movements of these actuators causes substantial motions of said first said effector toward or away from both of said extension connection locations.

'580 Patent 28:49–29:13.

Of particular relevance here, independent Claims 1 and 5 both contain the same limitations requiring a "first pair of base linear actuators each having an end thereof rotatable[5] connected to first frame extension at corresponding extension connection locations thereon, and each having that opposite end thereof rotatably connected to said first effector base." '580 Patent 27:57–27:63, 29:1–29:5.

The hand-like manipulator of Claim 1 is depicted in Figure 11 of the '580 patent, and a version of the relevant linear actuators are depicted in Figure 15. The relevant structures in Claims 1, 5, 14, and 15 are located within the palm, thumb, and finger components of Figure 11:

[5] The parties agreed to construe "rotatable" to be "rotatably" in both Claims 1 and 5. *Ross-Hime Designs*, 126 Fed. Cl. at 310–11.

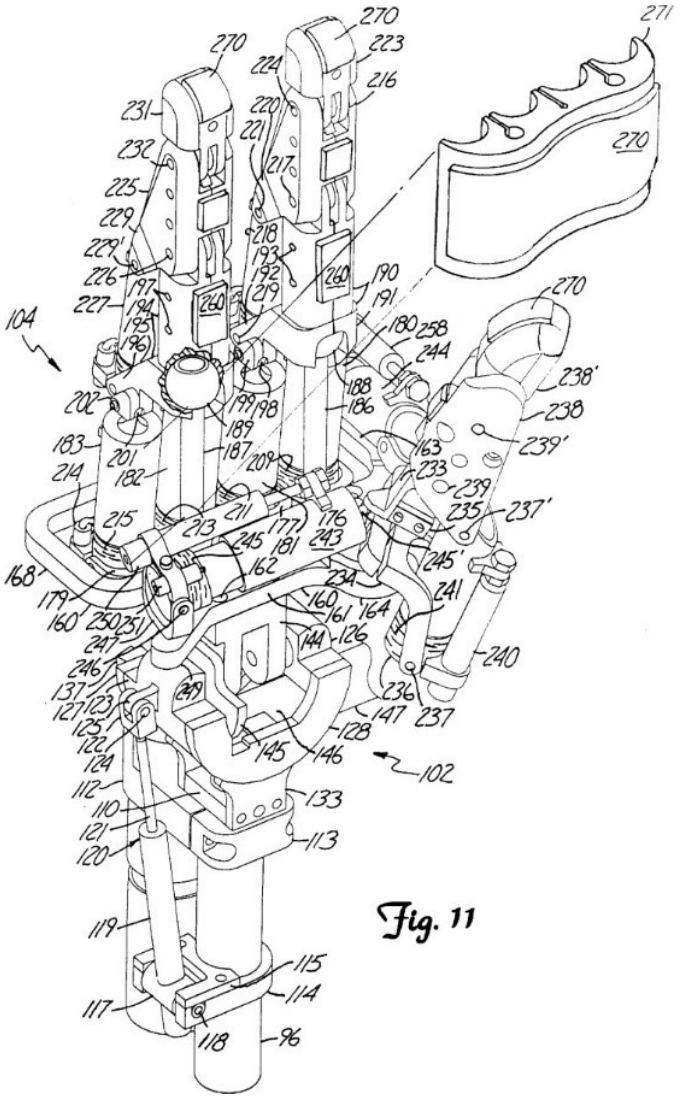


Fig. 11

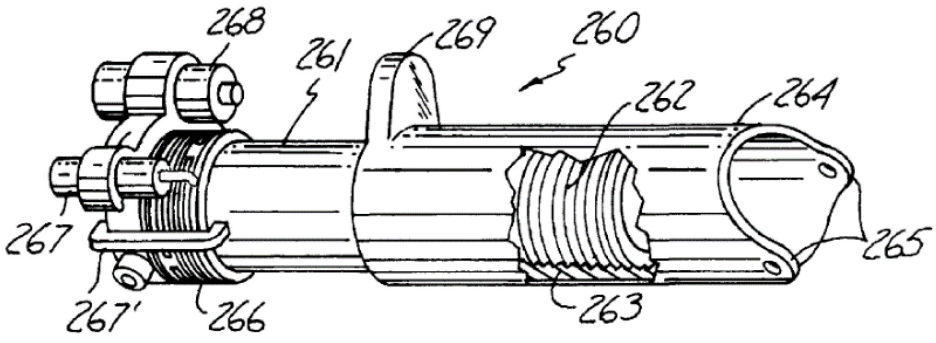


Fig. 15

'580 Patent Figs. 11 & 15.

B. The '962 Patent

The asserted claims of the '962 Patent also relate to hand-like manipulators "capable of engaging selected objects . . . ." '962 Patent 27:9–27:10. Ross-Hime alleges that Robonaut 2 infringes on Independent Claims 11 and 14 of the '962 Patent. (Def.'s Mot., Exs. C, D).

Independent Claim 11 recites a hand-like structure and provides:

> **11.** An articulated manipulating system for mounting on a base in a robotic manipulator and capable of engaging selected objects, said system comprising:
>
> a subbase rotatably mounted on said base to have a single subbase rotation axis therethrough;
>
> a first linear actuator coupled at one end thereof to said base and coupled at an opposite end thereof to said subbase to be capable of rotating said subbase about said subbase rotation axis;
>
> a first effector base rotatably connected to said subbase to have a first effector rotation axis;
>
> a second linear actuator coupled at one end thereof to said subbase and coupled at an opposite end thereof to said first effector base to be capable of rotating said first effector base about said first effector rotation axis.

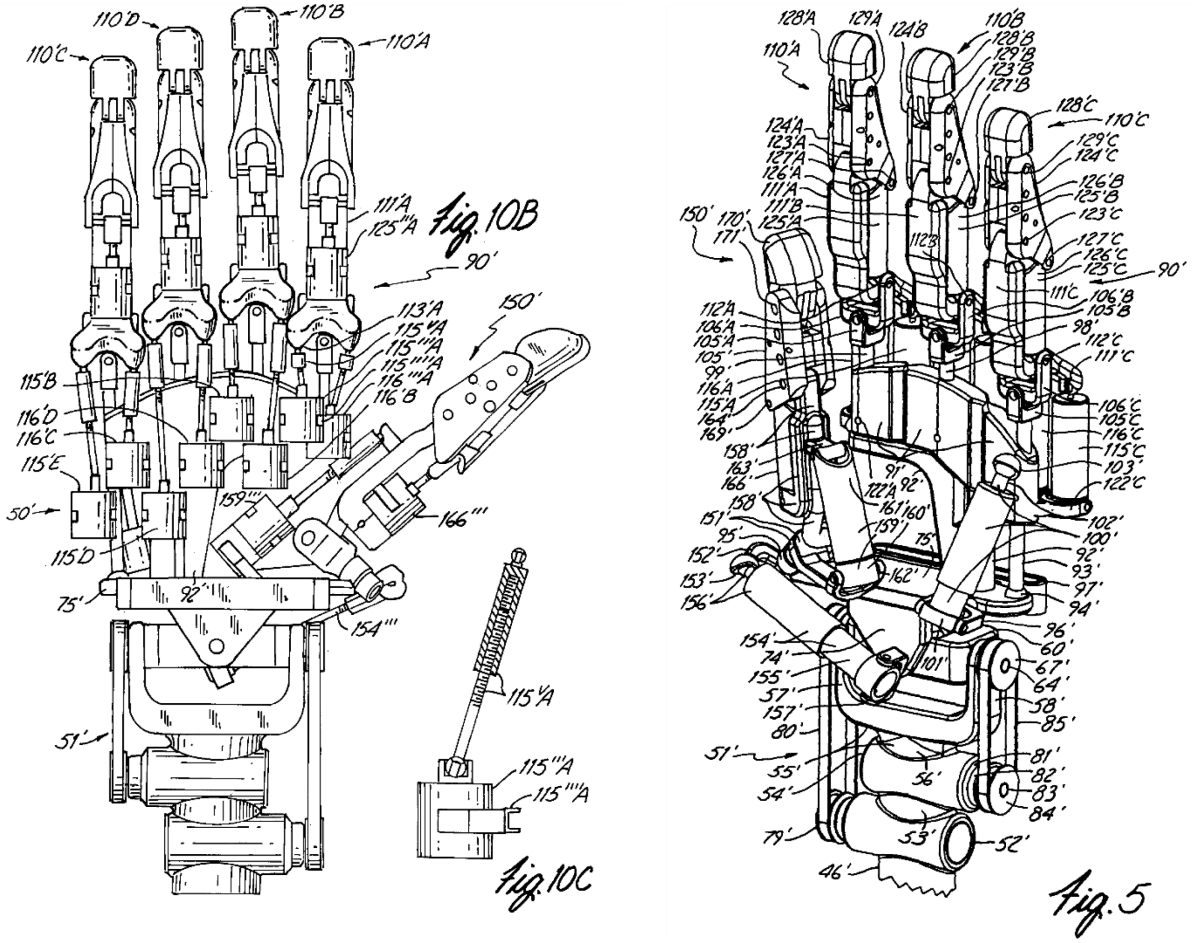
'962 Patent 27:9–27:23.

Independent Claim 14 recites a human thumb-like structure and teaches:

> **14.** An articulated manipulating system for mounting on a base in a robotic manipulator and capable of engaging selected objects, said system comprising:
>
> a plurality of shackles each having a pair of arms spaced apart by a recess space with said arms being joined in a joining structure on one side of said recess space;
>
> a plurality of effector bases each rotatably mounted at a pivot location thereof to and between said separate arms of a corresponding shackle so as to leave a recess space between an end of that said effector base rotatably mounted to said shackle and said joining structure thereof;
>
> a fixed pedestal affixed to said base and having said joining structure of a corresponding one of said plurality of shackles rotatably coupled thereto;
>
> a moveable pedestal rotatably connected to said base and having said joining structure of a corresponding one of said plurality of shackles rotatably coupled thereto;
>
> a pedestal linear actuator coupled at one end thereof to said base and coupled at an opposite end thereof to said moveable pedestal to be capable of rotating said moveable pedestal with respect to said base.

'962 Patent 27:56–28:10.

The hand-like manipulator is depicted in Figure 10B of the '962 patent, and the linear actuators depicted in Figure 10C. Figure 5 depicts the palm side of the hand-like manipulator of Claim 14 that contains the "shackle" system supported on a "fixed pedestal." The "shackles" are labeled as 106'A, 106'B, and 106'C in Figure 5.



'962 Patent Figs. 5, 10B, 10C.

C. NASA's Robonauts

NASA developed the Robonaut hand to assist with extravehicular activity on the then-in-progress International Space Station. *Ross-Hime Designs, Inc. v. United States*, 139 Fed. Cl. 444, 449–50 (2018) (Op. Granting-in-Part and Denying-in-Part Def.'s Mot. to Dism.) (ECF No. 287). Because many space station systems and tools were designed for human operators, it was essential that this robotic system have a high degree of anthropomorphic dexterity. *Id.* The Robonaut hand was one of several robotic hands that were being developed to reduce the number of instances where astronauts were forced to leave the space vehicle and expose themselves to the dangers of space. *Id.* In order to limit an astronaut's extravehicular time, the Robonaut hand needed to possess the dexterity equal to that of an astronaut wearing a pressurized spacesuit. *Id.*

This would allow the robotic hand to work with human-rated tools and interface with systems on the space vehicle that were designed for human operation. *Id.*

Robonaut 1 is described in U.S. Patent No. 6,244,644 ("the '644 Patent"). (*See* Def.'s Mot., Ex. J). NASA presented a version of its Robonaut 1 hand at the 1999 International Conference on Robotics and Automation of the Institute of Electrical and Electronics Engineers. *Ross-Hime Designs*, 139 Fed. Cl. at 452. At that conference, the named inventors of the '644 Patent, Dr. Diftler and Mr. Lovchik, presented the assembled hand with an accompanying paper entitled *The Robonaut Hand: A Dexterous Robot Hand for Space*, subsequently published in the proceedings of the conference. *Id.*

The '644 Patent generally teaches a compact dexterous robotic hand, which resembles a human hand and forearm. The motors for the finger actuators are housed in the forearm section and connected to a flexible tube, which is in turn, connected to a "lead screw assembly." (*See* Def.'s Mot., Ex. I at § 3.1). As the motor turns the flexible tube, the lead screw in the lead screw assembly rotates, causing a nut to slide forward and backward within the shell of the lead screw assembly. (*Id.*). The other end of the nut is connected to a flexible cable, which runs through the wrist-like structure. (*Id.*). These flexible cables are fixed to finger segments in cammed grooves by a piece of metal that is screwed into the side of the finger shells. (*Id.* at § 3.1–3.2; Def.'s Mot., Ex. H). Thus, as the nut in the lead screw assembly moves forward and backward, the flexible cable causes the finger segments to curl or extend. A model of the Robonaut 1 hand is provided in Figure 2 of the '644 Patent, with lead screw assemblies labeled **54** and flexible cable labeled **60**. The lead screw assemblies are depicted in Figure 5:

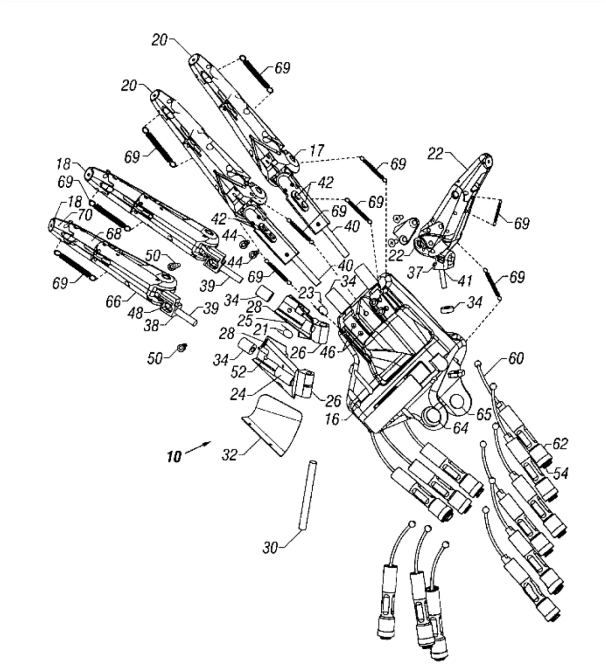


FIG. 2

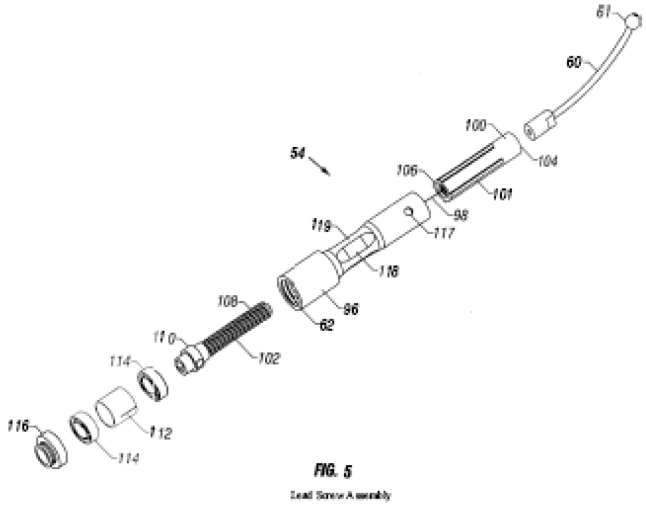


FIG. 5

'644 Patent, Figs. 2, 5.

The ’644 Patent depicts how the flexible cables **60** connect with and articulate the finger segments in Figures 9A, 9B, and 10A:

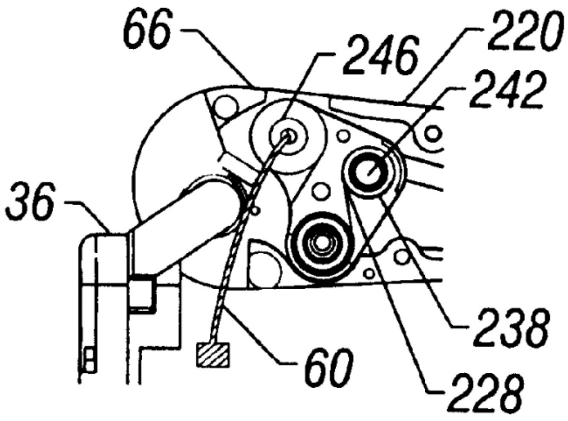


FIG. 10A

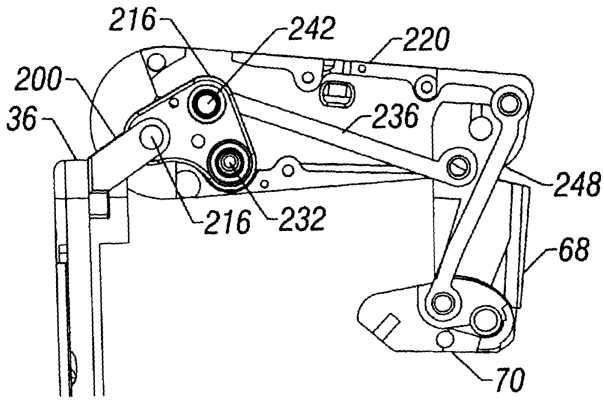


FIG. 9B

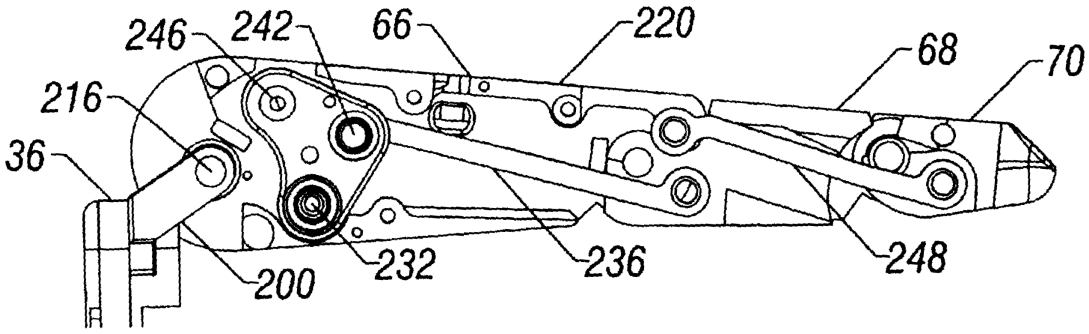


FIG. 9A

’644 Patent, Figs. 9A, 9B, 10A.

Eventually, NASA developed a second-generation version of the Robonaut unit, designated Robonaut 2. *Ross-Hime Designs*, 139 Fed. Cl. at 454. Articles detailing the progress NASA had made on the Robonaut were featured in Volume 14 of *Autonomous Robots*, published in 2003, in the 2005 and 2007 *Proceedings of the IEEE International Conference on Robotics and Automation*, and in the *Proceedings of the 2004 Conference on Human-Computer Interaction*. *Id.* Robonaut 2 is described in U.S. Patent No. 8,467,903 to Ihrke et al. ("the '903 Patent"), (Def.'s Mot., Ex. M), U.S. Patent No. 8,498,741 to Ihrke et al. ("the '741 Patent"), (Def.'s Mot., Ex. N), and U.S. Patent No. 8,562,049 to Ihrke et al. ("the '049 Patent"), (Def.'s Mot., Ex. O). The linear actuators in Robonaut 2 are located in the forearm, and are comprised of a motor, gear head, and ball screw assembly. (*See* Def.'s Mot., Exs. K, L). The linear actuators are connected to tendons which run from the forearm, through the wrist, to designated finger segments. (Def.'s Mot., Ex. K at 17–27). The extending piece of the linear actuators contains a "tendon hook," which connect a "tendon loop." (Def.'s Mot., Ex. K at 27). The tendon is then routed through the wrist inside of a conduit and is "mechanically anchored" using a "tendon terminator" to the finger or thumb segment. (Def.'s Mot. at 23, Ex. K at 30, Ex. L at § III.D & Fig. 9). Thus, as the extending end of the linear actuator retracts, the tendon pulled and exerts force on the finger or thumb segment to which it is connected. (Def.'s Mot., Ex. L at § III.D).

The Robonaut 2 finger actuation system is depicted in Figure 4 of the '903 Patent, and the finger actuator assemblies are depicted in Figure 5:

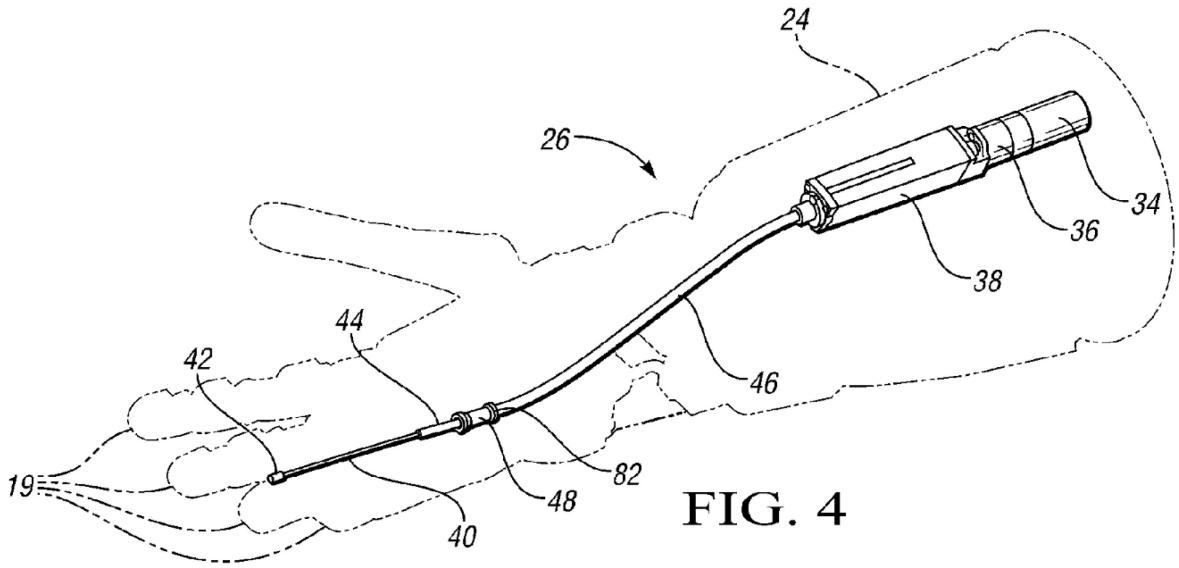


FIG. 4

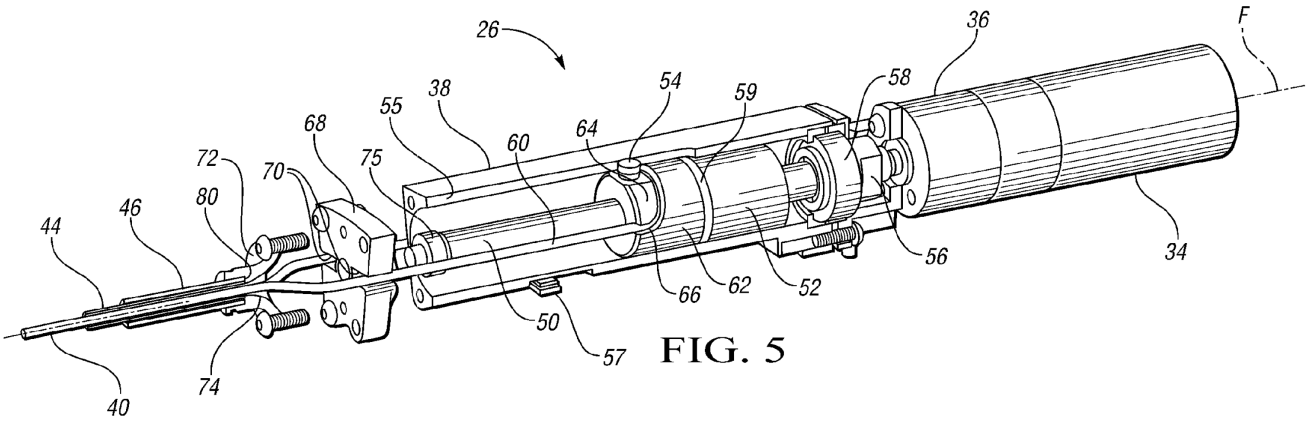


FIG. 5

'903 Patent, Figs. 4, 5 (Def.'s Mot., Ex. M).

D. Procedural History

On April 29, 2016, the Court issued its Claim Construction Opinion, construing four disputed terms found in the patents-in-suit. *Ross-Hime Designs*, 126 Fed. Cl. at 299. Those terms included "linear actuator," "differentials in movement," "common movements," and "shackle." *Id*. The Court construed the first three terms but declined to construe "shackle," reasoning its meaning was discernably clear from the claim language. *Id*. The Court determined that the term "linear actuator," which is used in all the asserted claims, would be understood by a person of ordinary skill in the art to mean "a device, with ends defined by a base piece and an extending piece, that converts some kind of power into linear motion such that the extending piece moves in a straight line relative to the base piece." *Id.* at 321. The Court was explicit that the term does not include "'specialized' or 'converted end' linear actuators because these 'specialized' features are also separate structures, such as . . . flexible tape." *Id.*

On March 14, 2017, Ross-Hime served its final infringement contentions on the United States, as required by the Court's December 6, 2016 Order, (ECF No. 229). (*See* Def.'s Mot., Ex. C). Nearly two months later, on May 12, 2017, Ross-Hime served an updated version of its final infringement contentions as to Robonaut 1. (Def.'s Mot., Ex. F (Updated Final Infringement Contentions), Ex. G (Updated Final Infringement Claim Chart Showing Changes From Original)). Ross-Hime's "updated" final claim infringement chart only contained modifications to Ross-Hime's claims of infringement of the '580 Patent by Robonaut 1. (*See* Def.'s Ex. F at 1).

Fact discovery closed on June 4, 2019. (*See* ECF No. 294). The parties exchanged initial expert reports on October 3, 2019, and responsive expert reports on December 20, 2019. Expert discovery opened on January 8, 2020, and closed on January 17, 2020. The United States filed the present Motion for Summary Judgment on January 30, 2020. Ross-Hime filed its Response on February 24, 2020 (Pl.'s Resp., ECF No. 314), and on March 10, 2020, the United States filed its Reply (Def.'s Reply, ECF No. 323).

In addition, the United States filed a motion *in limine* on February 28, 2020, seeking to exclude the testimony and reports of Ross-Hime's expert, Theodore Neils, from trial. (Def.'s Mot. in Lim., ECF No. 318). This motion became fully briefed on March 11, 2020. (*See* ECF

No. 325). On March 13, 2020, the Court stayed all proceedings in this case in light of the ongoing pandemic. (ECF No. 327). On October 26, 2020, the Court lifted the stay. (ECF No. 328).

II. Legal Standards

A. Patent Infringement

This Court possesses exclusive jurisdiction to adjudicate infringement claims against the United States "[w]henever an invention described in and covered by a patent of the United States is used or manufactured by or for the United States without license of the owner thereof or lawful right to use or manufacture the same." 28 U.S.C. § 1498(a). Section 1498 serves as a limited waiver of sovereign immunity and, therefore, must be construed narrowly. *Liberty Ammunition, Inc. v. United States*, 835 F.3d 1388, 1394 n.3 (Fed. Cir. 2016); *see also Leesona Corp. v. United States*, 599 F.2d 958, 966 (Ct. Cl. 1979) (en banc).

In a patent infringement analysis, the Court first "determines the scope and meaning of the asserted claims," then compares the properly construed claims to the allegedly infringing device. *Mas-Hamilton Grp. v. LaGard, Inc.*, 156 F.3d 1206, 1211 (Fed. Cir. 1998) (citing *Markman v. Westview Instruments, Inc.*, 517 U.S. at 372–74). The interpretation of a patent's claims is the assembly by which either literal infringement or infringement by the doctrine of equivalents is measured. *See id.*

"To prove literal infringement, the patentee must show that the accused device contains every limitation in the asserted claims. If even one limitation is missing or not met as claimed, there is no literal infringement." *Mas-Hamilton Grp.*, 156 F.3d at 1211. Under the doctrine of equivalents, "a product of process that does not literally infringe upon the express terms of a patent claim may nonetheless be found to infringe if there is 'equivalence' between the elements of the accused product or process and the claimed elements of the patented invention." *Warner-Jenkinson Co. v. Hilton Davis Chem., Co.*, 520 U.S. 17, 21 (1997) (citing *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 609 (1950)). Because "[e]ach element contained in a patent claim is deemed material to defining the scope of the patented invention, . . . the doctrine of equivalents must be applied to individual elements of the claim, not to the invention as a whole." *Warner-Jenkinson Co.*, 520 U.S. at 29. However, "a court may not, under the guise of applying the doctrine of equivalents, erase a plethora of meaningful structural and functional limitations of the claim on which the public is entitled to rely in avoiding infringement." *Perkin–Elmer Corp. v. Westinghouse Elec. Corp.*, 822 F.2d 1528, 1532 (Fed. Cir. 1987).

B. Summary Judgment

Summary judgment is appropriate "if the movant shows that there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law." RCFC 56(a). The moving party bears the initial burden of proof, but this burden may be discharged by showing the absence of evidence supporting the opposing party's claim. *See Celotex Corp. v. Catrett*, 477 U.S. 317, 325 (1986). In moving for summary judgment of non-infringement, "all that is required is 'notice to the party with the burden of proof that she had to come forward with all of her evidence.'" *Exigent Tech., Inc. v. Atrana Solutions, Inc.*, 442 F.3d 1301, 1308 (Fed. Cir. 2006) (quoting *Celotex Corp.*, 477 U.S. at 326) (internal alterations omitted). In other words, "nothing more is required than the filing of a summary judgment motion stating that the patentee

had no evidence of infringement and pointing to the specific ways in which accused systems did not meet the claim limitations." *Id.* at 1309.

If the moving party makes such a showing, the burden shifts to the non-moving party to present such evidence. *Celotex Corp*., 477 U.S. at 324. The nonmoving party "must do more than simply show that there is some metaphysical doubt as to the material facts," it must come forward with "specific facts showing that there is a genuine issue for trial." *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 586–87 (1986) (emphasis and citations omitted). "A nonmoving party's failure of proof concerning the existence of an element essential to its case on which the nonmoving party will bear the burden of proof at trial necessarily renders all other facts immaterial and entitles the moving party to summary judgment as a matter of law. *Dairyland Power Co-op v. United States*, 16 F.3d 1197, 1202 (Fed. Cir. 1994) (citing *Celotex Corp.*, 477 U.S. at 323).

III. Discussion

The United States moved for summary judgment of non-infringement as to all asserted claims, and invalidity of Claim 11 of '962 Patent. (*See generally* Def.'s Mot.). With respect to its non-infringement contentions, the United States argues "Plaintiff cannot show that [Robonaut 1] meets every limitation of '580 Claim 5 because the actuators used in [Robonaut 1] do not have rotatable connections as claimed." (Def.'s Mot. at 18). An actuator, the parties agree, is simply a device that converts power to motion. *Ross-Hime Designs*, 126 Fed. Cl. at 315. Similarly, the United States contends that "Plaintiff cannot show that [Robonaut 2] meets every limitation of any asserted claim of either the '580 Patent or the '962 Patent because the linear actuators used in [Robonaut 2] are located in the forearm and fixedly connected there." (Def.'s Mot. at 22). Regarding its invalidity argument, the United States submits that U.S. Patent No. 4,367,891 (Wauer) anticipates Claim 11 of the '962 Patent. (*Id.* at 32).

In response, Ross-Hime relies exclusively on the testimony of its expert, Theodore Neils, and its infringement contention charts, to argue that NASA's Robonauts contain every limitation in the asserted claims.[6] (*See generally* Pl.'s Resp.). Ross-Hime also contends that Wauer does not anticipate Claim 11 of the '962 Patent because, according to Ross-Hime, Wauer does not have any members with a "single member rotation axis extending through it to meet [C]laim 11." (Pl.'s Resp., at 20–23).

In its Reply, the United States argues that Ross-Hime "ignores the Court's claim construction and reads out clear structural limitations of the asserted claims." (Def.'s Reply at 1, ECF No. 323). Additionally, the United States contends that, with respect to the invalidity argument of '962 Claim 11, Ross-Hime's argument "would add limitations to the claims that are simply not there." (Def.'s Reply at 1).

[6] Large sections of Ross-Hime's brief are merely word-for-word quotations of Neils' expert reports and Ross-Hime's infringement contention charts. (*Compare* Pl.'s Resp. at 4–5, *with* Pl.'s Resp., Ex. 4 at 13–14, 15–16 (Neils' Reply Report), *and* Pl.'s Resp. at 6–9, *with* Pl.'s Resp., Ex. 1-1 at 3–7).

As explained below, the Court concludes that neither Robonaut 1 nor Robonaut 2 infringe on the asserted claims in the '580 and '962 Patents. In light of this determination, there is no need to address the United States' argument regarding the invalidity of '962 Patent Claim 11.

A. Infringement of the '580 Patent by Robonaut 1

Ross-Hime asserts that NASA's Robonaut 1 infringes on Claim 5 of the '580 Patent. In moving for summary judgment of non-infringement, the United States argues that Robonaut 1 does not contain all the limitations included in Claim 5, namely, "a first pair of base linear actuators each having an end thereof rotatabl[y] connected to said first frame extension at corresponding extension connection locations thereon, and each having that opposite end thereof rotatably connected to said first effector base at corresponding effector connection locations thereon." (Def.'s Mot. at 1, 18–22). According to the United States, Robonaut 1 does not include any actuator with one end "rotatably" connected to a "first frame extension," and an opposite end "rotatabl[y] connected to a "first effector base," because the linear actuators are connected to the "forearm" on one end, rather than to a "first frame extension," and fixedly connected to a flexible cable, rather than to a "first effector base," on the opposite end. (Def.'s Mot. at 18–22). The United States contends that because the Court expressly excluded "specialized" or "converted ends" from the construction of the term "linear actuator," *see Ross-Hime Designs*, 126 Fed. Cl. at 299, 321, Ross-Hime cannot prove that Robonaut 1 contains all of the limitations included in Claim 5. (Def.'s Mot. at 20–22).

In response, Ross-Hime identifies the connection between the lead screw assembly and palm housing, whereby the lead screw rotates inside the lead screw assembly relative to the palm housing via a motor affixed to Robonaut 1's forearm, as the "rotatable" connection between the actuator and "first frame extension" taught by Claim 5. (Pl.'s Resp. at 2–5). Ross-Hime further identifies the flexible cables **60** in Robonaut 1, which connect the lead screw assemblies to proximal finger half shells, as the "rotatable" connection between the actuator and "first effector base." (Pl.'s Resp. at 5). Recognizing that the Court's construction of the term "linear actuator" expressly excluded "specialized" and "converted end" linear actuators, Ross-Hime argues that "only the straight line motion end of a cable **60** is included as being in the distributed linear actuator." (Pl.'s Resp. at 5). According to Ross-Hime, "[Robonaut 1] as described in [the '644 Patent] shows cables **60** each extending from corresponding lead screw assembly **54** to a corresponding finger segment which rotates with an end of that cable locked therein so that the cable bends (rotates to various degrees) to follow the finger segment rotation." (Pl.'s Resp. at 5). Alternatively, Ross-Hime contends that the flexible cable "can be considered in its entirety as a rotatable connection thereby omitting any part of it being a part of a linear actuator, and thereby leaving the cable in its entirety in the claimed rotatable connection between the lead screw assembly **54** and the finger segment." (Pl.'s Resp. at 6).

In its Reply, the United States maintains that Robonaut 1 does not contain a rotatable connection between a linear actuator and first frame extension, reasoning "the shell of the leadscrew assembly is part of the actuator and not part of the palm [and] [t]he actuator is actually fixed to the palm at the shell of the leadscrew assembly." (Def.'s Reply at 2–3). Similarly, the United States argues Ross-Hime has failed to establish that Robonaut 1 contains an actuator "rotatabl[y] connected to said first effector base at corresponding effector connection locations" because Ross-Hime "fails to recognize that cable **60** (as identified in the '644 Patent) is a separate structure from the nut (body **100** as identified in the '644 Patent), and so is not part of

the linear actuator under the Court's claim construction of the term." (Def.'s Reply at 3–4). With respect to Mr. Neils' assertion that "only the straight line motion end of a cable **60** is included as being in the distributed linear actuator," the United States argues that this statement likewise "ignores the Court's claim construction, which specifically excluded 'separate structures' from the construction of linear actuator" by "split[ting] the separate structure (cable **60** as identified in the '644 Patent) into two sub-structures: one that moves with 'straight line motion' and another that (apparently) does not move in a straight line." (Def.'s Reply at 4). The United States further contends that Ross-Hime's argument reads out the limitation that the opposite end of the actuator be "rotatably connected to said first effector base at corresponding effector connection locations thereon." (Def.'s Reply at 5) (emphasis in original). Finally, with regard to Mr. Neils' expected testimony that "cable **60** just as clearly can be considered in its entirety as a rotatable connection . . . ," the United States argues that this likewise reads out the limitation that the opposite end of the actuator is "rotatably connected to said first effector base at corresponding effector connection locations thereon. (Def.'s Reply at 5) (emphasis in original).

In light of the Court's construction of the term "linear actuator" and the parties' stipulations as to other pertinent terms, the Court concludes that Robonaut 1 does not infringe on Claim 5 of the '580 Patent. The relevant portion of Claim 5 describes a pair of linear actuators positioned between, and rotatably connected to, a "first frame extension" on one end, and a "first effector base" on the other. *See* '580 Patent 29:1–29:6. The Court construed the term "linear actuator" to mean "a device, with ends defined by a base piece and an extending piece, that converts some kind of power into linear motion such that the extending piece moves in a straight line relative to the base piece." *Ross-Hime Designs*, 126 Fed. Cl. at 321.

Under this construction, Ross-Hime contends that the "linear actuators" in Robonaut 1 are comprised of: "actuators **91** as power sources, flexible shafts **92**, lead screw assemblies **54** and cables **60**." (*See* Pl.'s Resp. at 6–7)[7]. Putting aside that the actuators in Robonaut 1 are specifically identified in the '644 Patent, Ross-Hime identifies the "lead screw **102**," which is itself a sub-structure of the lead screw assembly **54**, as the "end" of the linear actuator that is rotatably connected to a first frame extension, which Ross-Hime identifies as the palm housing **16**. (*Id.*). Ross-Hime then identifies the connection between one end of the lead screw and "coupling end **62** of sleeve **117**" as the rotatable connection between the actuator and first frame extension. (*Id.* at 7). According to Ross-Hime, this is so because "[t]he lead screw **102** includes an opposing end **110** rotatably mounted within the coupling end **62** of sleeve **117**," and the "upper end of each tubular sleeve **117** is *securely clamped* to the palm housing **16**." (*Id.*) (emphasis added).

[7] Quizzically, Ross-Hime cites to Mr. Neils' expert report on infringement of the '580 Patent by Robonaut 2 for this proposition, in the section arguing that Ross-Hime's Infringement Claim Charts support its contentions as to Robonaut 1. (*See* Pl.'s Resp. at 6–9 (citing Pl.'s Ex. 2); *see also* Pl.'s Resp., Ex. 1.1 at 3–7 (Expert Report '580 R1 Infringement Claim Chart); Def.'s Ex. G at 4–7 (Pl.'s Second Am. Infringement Claim Chart)). Further, Ross-Hime copies large portions of Mr. Neils' rebuttal infringement report, (Pl.'s Ex. 4), with citations but without quotation marks. As the United States correctly observes, this "creates the confusing impression that Mr. Neils' expert reports are merely attorney argument masquerading as expert opinion." (Def.'s Reply at 4 n.6).

Ross-Hime's arguments are flawed and fail to rebut the United States' non-infringement contentions as to Robonaut 1. Principally, Ross-Hime, by its own terms, identifies the "linear actuators" in Robonaut 1 as being comprised of several elements, including "actuators **91** as power sources, flexible shafts **92**, lead screw assemblies **54** and cables **60**." (*See* Pl.'s Resp. at 6–7). It then separates the sub-structures in the lead screw assembly and disregards other elements of what it calls linear actuators, namely the "actuator **91**." As Ross-Hime acknowledges, the actuators **91** are the "power sources" that drive or create the (actuation) motion. (*See* Pl.'s Resp. at 6 (quoting Robonaut 1 Infringement Claim Chart)); *see also Ross-Hime Designs*, 126 Fed. Cl. at 321 (construing "linear actuator" to mean "a device, with ends defined by a base piece and an extending piece, that converts some kind of power into linear motion . . ."). The lead screw assembly is part of the linear actuator by Ross-Hime's own admission, and is the portion that converts the rotational motion from the motor—*i.e.*, actuator **91**—and flexible shaft into linear motion. Yet, despite listing "actuators **91**" as a component of the "linear actuator," and the United States repeatedly stating that the actuators are located in and fixed to the forearm, (*see* Def.'s Mot. at 18–20), Ross-Hime ignores this component altogether.

Instead, Ross-Hime and Mr. Neils note that the tubular sleeve structure of the lead screw assembly is affixed to the palm housing and argue that the rotation of the lead screw inside the lead screw assembly constitutes the rotatable connection between the linear actuator and first frame extension. (Pl.'s Resp. at 4–5, 6–7). In other words, Ross-Hime argues that the lead screw assembly constitutes a linear actuator and that the rotation of the lead screw, which creates the linear "actuation" movement, is the rotatable connection taught by Claim 5. Logically, a "rotatable connection" within the linear actuator structure itself cannot constitute a rotatable connection between the linear actuator and first frame extension, as Claim 5 requires. Moreover, by arguing that the lead screw assembly is the base piece of the linear actuator, Ross-Hime disregards the actuator **91** and flexible shaft **92** structures that it identifies as components of the linear actuators. (*See* Pl.'s Resp. at 6–7 (identifying the Robonaut 1 "linear actuators" as being comprised of "actuators **91** as power sources, flexible shafts **92**, lead screw assemblies **54** and cables **60**.")). Consequently, Ross-Hime has failed to identify the rotatable connection between the base end of a Robonaut 1 linear actuator and first frame extension required by Claim 5. Ross-Hime fails to present any argument concerning its theory of infringement under the doctrine of equivalents. As the United States has carried its initial burden by stating that Ross-Hime has no evidence of infringement and pointing to the specific ways in which Robonaut 1 does not meet the claim limitations of Claim 5, *see Celotex Corp.*, 477 U.S. 317, 325–26 (1986), and Ross-Hime has pointed to no facts showing a genuine issue of fact for trial, summary judgment of non-infringement by Robonaut 1 is appropriate. *See Mas-Hamilton*, 156 F.3d at 1211 ("If even one limitation is missing or not met as claimed, there is no literal infringement").

Although it is not necessary to reach this issue given the holding above, Ross-Hime likewise fails to show that the other "extending" end of Robonaut 1's actuators are "rotatably connected" to a first effector base. Ross-Hime identifies the flexible cable **60**, which is attached to the extending piece, or "body," of the lead screw assembly and is secured in a groove in the finger half shells, as this connection. (Pl.'s Resp. at 6–9). However, in construing the term "linear actuator," the Court was explicit that the term does not include "'specialized' or 'converted end' linear actuators because these 'specialized' features are also separate structures, such as the flexible tape in Figure 10 of the '580 Patent attached to the linear actuator ends." *Ross-Hime Designs*, 126 Fed. Cl. at 321; *see also id.* at 317 ("By 'converted end linear actuator,'

Plaintiff means a linear actuator that has an additional structure attached, such as the flexible tape **82** in Figure 10 of the '580 Patent."). In its response, Ross-Hime ignores this clear statement and identifies a separate structure, the flexible cable, as part of Robonaut 1's linear actuators. (Pl.'s Resp. at 6). Given the Court's claim construction opinion, Ross-Hime cannot demonstrate that Robonaut 1 has linear actuators with one end thereof rotatably connected to a first effector base as required by Claim 5 of the '580 Patent.

To the extent Ross-Hime relies on Mr. Neils' opinion that "only the straight line motion end of a cable **60** is included as being in the distributed linear actuator . . .," this does not save Ross-Hime's position. In construing the term "linear actuator," the Court referenced the "flexible tape" in Figure 10 of the '580 Patent, which connects the linear actuators to joint extensions. *Ross-Hime Designs*, 126 Fed. Cl. at 317–18. As explained in the '580 Patent, "movement of linear actuator **80** in Fig. 10, thereby forcing the upward end of the tape **82** connected to it, will lead to clockwise motion of joint extension **88**, and downward motion of linear actuator **80** will lead to counterclockwise motion of joint extension **88**." '580 10:32–10:36. Clearly, the upward or downward motion of the linear actuator causes the flexible tape to move, at least partially, in a straight-line motion. As such, the Court is unable to discern any distinction between the flexible tape in the '580 Patent and the flexible cable in Robonaut 1. Ross-Hime is simply advancing the same argument that was rejected by the Court during claim construction. *See Ross-Hime Designs*, 126 Fed. Cl. at 315–21 (rejecting Ross-Hime's argument that "[r]elative to its base, the linear actuator manipuable [sic] member *will move in a straight line*" and "the controlled movable output structure end of a linear actuator assembled in the hand moves in a straight line only relative to the base structure of the linear actuator.") (emphasis in original). Because the Court construed the term "linear actuator" as excluding "specialized" or "converted ends," *id.* at 321, the flexible cable in Robonaut 1 cannot be considered part of the linear actuator.

Mr. Neils' argument that "cable **60** can be considered in its entirety as a rotatable connection thereby omitting any part of it being a part of a linear actuator" likewise fails to establish a rotatable connection between a linear actuator and effector base. (*See* Pl.'s Resp. at 6). In construing the term linear actuator as excluding "specialized" or "converted end[s]," the Court rejected a version of Mr. Neils' argument, explaining "[t]he capability of the linear actuator to turn in arcing movements in space . . . is expressed in the claims by the rotatable connections on either end of the linear actuator not the linear actuator itself." *Ross-Hime Designs*, 126 Fed. Cl. at 321. If the cable is not part of the linear actuator, then the linear actuator is connected to the cable, not to the first effector base as Claim 5 requires. *Cf. id.* at 318 ("The linear actuator in Figure 10 is depicted as structure **80**, and the flexible tape is considered a separate structure **82**. Accordingly, what Plaintiff calls a 'converted end linear actuator' is comprised of two separate structures—the actuator *and* the tape, not one integrated structure."). Accordingly, Mr. Neils' opinion that "cable **60** can be considered in its entirety as a rotatable connection thereby omitting any part of it being a part of a linear actuator" does not comport with the Court's construction of "linear actuator." Thus, Ross-Hime has failed to show that Robonaut 1 contains a linear actuator with its extending end attached to a first effector base as required by Claim 5 of the '580 Patent.

In sum, the United States has carried its burden of showing the absence of proof as to infringement of Claim 5 of the '580 Patent by Robonaut 1, specifically that Robonaut 1 contains "a first pair of base linear actuators each having an end thereof rotatabl[y] connected to said first frame extension at corresponding extension connection locations thereon, and each having that

opposite end thereof rotatably connected to said first effector base at corresponding effector connection locations thereon." Ross-Hime has failed to point to evidence of such infringement and thus failed to point to specific facts showing that there is a genuine issue of fact for trial. *See Mas-Hamilton*, 156 F.3d at 1211 ("If even one limitation is missing or not met as claimed, there is no literal infringement"). Furthermore, Ross-Hime failed to present any argument concerning its theory of infringement under the doctrine of equivalents. Therefore, summary judgment of non-infringement is appropriate.

B. Infringement of the '580 Patent by Robonaut 2

Ross-Hime asserts that Robonaut 2 infringes on Claims 1, 5, 14, and 15 of the '580 Patent. Independent Claims 1 and 5 both require a "first pair of base linear actuators each having an end thereof rotatabl[y] connected to said first frame extension at corresponding extension connection locations thereon, and each having that opposite end thereof rotatably connected to said first effector base . . .." '580 Patent 27:57–27:61, 29:1–29:5. Claim 14 depends from Claim 1 and thus includes all of the limitations of Claim 1, as well as additional limitations. 35 U.S.C. § 112 ¶ 4.[8] Claim 15 depends from Claim 14, and thus contains all the limitations of Claims 14 and 1, as well as additional limitations. § 112. Therefore, all of the asserted claims as to Robonaut 2 include the limitations of "first pair of base linear actuators each having an end thereof rotatabl[y] connected to said first frame extension at corresponding extension connection locations thereon, and each having that opposite end thereof rotatably connected to said first effector base." Because the asserted claims all contain the same limitations, and Ross-Hime addresses these claims together, (*see* Pl.'s Resp. at 11–14), the Court will not discuss each claim separately.

The United States contends that Robonaut 2 does not infringe on any asserted claim of the '580 Patent for the same reasons that it alleges Robonaut 1 does not infringe on the '580 Patent, which is: (1) the linear actuators are located in and fixedly connected to, the forearm, rather than a "first frame extension"; and (2) the extending portion of the linear actuators are connected to tendons—a separate structure under the Court's claim construction—rather than to a "first effector base." (Def.'s Mot. at 22–27). According to the United States, Ross-Hime's infringement claim charts identifies a tension sensor as the base piece of the linear actuator, and a tendon terminator as the opposing end of the linear actuator, both of which are separate structures under the Court's claim construction and thus not part of the linear actuators. (*Id.*).

In response, Ross-Hime claims that the United States' position is incorrect because it "avoided using Plaintiff's claim chart evidence," then curiously, relies only on Mr. Neils' reply infringement report as evidence that there exists a genuine dispute of material fact. (*See* Pl.'s Resp. at 11–14).[9] Mr. Neils opined that Robonaut 2 "literally does have linear actuators as

[8] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (AIA), became effective on September 16, 2012. The AIA amended Section 112 and re-designated its subsections. As the applications resulting in the '580 Patent and the '962 Patent were filed before that date, the pre-AIA version of § 112 applies.

[9] Ross-Hime cites to what it labeled as Mr. Neils' Expert Report: '580 Patent Robonaut 2 Infringement Claim Chart for this statement (Pl.'s Resp., Ex. 2-1). However, in a disturbing admission, Mr. Neils testified at his deposition held January 16–17, 2020, that he did not

described in Claims 1, 5, 14, and 15 of the '580 Patent."[10] (Pl.'s Mot. at 11). As stated in the March 14, 2017 Infringement Claim Chart, Ross-Hime identifies the linear actuators in Robonaut 2, which is described in the '941 thumb and '049 finger Patents, as being comprised of "finger actuator assemblies **26**, actuator housing **38**, end cap **68**, splitter **72**, motors **34**, gear drives **36**, ball screws **50**, conduits **46**, tension sensors, [base piece], ball nuts **52**, tendon housings **62** [extending piece]."[11] (Pl.'s Resp., Ex. 2-1 at 4 (brackets in original) (citing the '903 Patent)). Mr. Neils opines that "the motors and connected drive mechanisms are commonly termed a 'linear actuator' and that they meet the Court's linear actuator definition through having 'the linear motion driving parts thereof forming the extending piece and leaving the remaining parts of the arrangement forming the base piece.'" (Pl.'s Resp. at 12). Mr. Neils states repeatedly that the tendons in Robonaut 2 are not part of the actuators and offers several opinions as to how Robonaut 2 infringes on the '580 Patent. (Pl.'s Resp., Ex. 4 at 20–21 ("the actuators **26** are motors operatively connected to tendons by drive mechanisms – there is no wording therein that includes the tendons in the actuators") ("The operation of 'driving the tendons' does not make the tendons part of that which drives them") ("there is no requirement that the flexible tendon be a part of the linear actuator extending piece")).

As discussed in detail below, Mr. Neils' opinions as to infringement of '580 Patent Claims 1, 5, 14, and 15 are flawed. Moreover, despite the United States' repeated arguments that Robonaut 2 does not meet the limitation of a "first pair of base linear actuators rotatably connected to a first frame extension," (*see* Def.'s Mot. at 25–27), Ross-Hime does not address this claim limitation. Ross-Hime presents no argument regarding its theory of infringement under the doctrine of equivalents. Consequently, the United States has carried its burden of "pointing to the specific ways in which the accused systems [do] not meet the claim limitations," *Exigent Tech.*, 442 F.3d at 1309, and Ross-Hime has failed to come forward with "specific facts showing that there is a genuine issue for trial." *Matsushita Elec. Indus.*, 475 U.S. at 586–87; *Mas-Hamilton*, 156 F.3d at 1211 ("If even one limitation is missing or not met as claimed, there is no literal infringement").

The cited portions of Mr. Neils' expert reply report concern the limitation requiring a "first pair of base linear actuators . . . each having that opposite end thereof rotatably connected

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consider or prepare the new infringement charts and that those charts were appended to his completed reports before being exchanged. (*See* Def.'s Mot. in Lim., at 13–14 (quoting Neils' Deposition Testimony)). Consequently, the United States filed a separate motion *in limine* to exclude Mr. Neils' testimony and expert reports. (*See* ECF Nos. 318, 319). Aside from that dispute, it is unclear which claim charts Ross-Hime's statement refers to, as the United States cited to portions of Ross-Hime's claim charts that were not changed in its second amended claim charts. (*See e.g.*, Def.'s Mot. at 21–22, 25–31). Moreover, Ross-Hime's second amended claim charts only amended its infringement contentions as Robonaut 1, and did not amend any contentions as to Robonaut 2. (*See* Def.'s Mot., Ex. F at 1).

[10] Mr. Neils also opined on infringement by Robonaut 2 under the doctrine of equivalents. Although Ross-Hime claims infringement under the doctrine of equivalents in its complaint, it does not mention or reference the doctrine of equivalents anywhere in its response brief.

[11] Ross-Hime does not mention or refer to this characterization anywhere in its response brief.

to said first effector base at corresponding effector connection locations." (*See* Pl.'s Resp. at 11–14). Mr. Neils first opines, in an apparent contradiction of his repeated statements that the tendons are not a part of the actuators, that the "straight line moving portion" of the tendon is "part of a connected linear actuator," and the "bendable, or rotatable portion" is the "rotatable connection of the extending piece to a moveable component." (*Id.* at 12 (quoting Ex. 4 at 20)). This argument contains the same fatal flaws that plagued Ross-Hime's Robonaut 1 analysis, namely that it ignores the Court's explicit statement that the term "linear actuator" does not include separate structures that are attached to the ends of the actuator. *See Ross-Hime Designs*, 126 Fed. Cl. at 317–18, 321. Despite an apparent recognition of that clear statement, Mr. Neils breaks apart the separate structure of the tendon into two sub-structures, and claims that the "straight line moving portion" is part of the linear actuator. As this assertion is not in accordance with the Court's construction of the term "linear actuator," it fails to rebut the United States' non-infringement contentions. *See id.*

Next, Mr. Neils opines that, alternatively, the entire tendon itself can be considered the "rotatable connection between the linear actuator and finger segment being moved because the entire tendon is bendable" and "its overall bendability, or rotatability, still allows angular positional changes between the connected bodies." (Pl.'s Resp. at 12, Ex. 4 at 20). In making this argument, Mr. Neils identifies the "rotatable connection" as the tendon itself, the "first effector base" as the finger segments, and the "corresponding effector connection locations" as the tendon terminators, which connect the tendons to the finger segments. (*See* Pl.'s Resp., Ex. 2-1 at 7). The parties stipulated that "rotatable connect[ion]" has a plain and ordinary meaning. *Ross-Hime Designs*, 126 Fed. Cl. at 311. The parties also agreed that "effector connection locations thereon" should be construed to mean "locations on the first effector base." *Id.* Under a plain reading, "rotatable" modifies the word "connection" in that it specifies the type of connection. Thus, the asserted claims in the '580 Patent require the extending ends of the linear actuators to be connected to "locations on the first effector base" and that the connection be "rotatable." As the United States correctly observes, Mr. Neils' argument reads out this claim limitation. Indeed, the introduction of two separate connections between the actuators and effector bases—one between the extending end of the actuator and the tendon, the other between the tendon and tendon terminator—belies any notion that the actuators are rotatably connected to a first effector base as the '580 Patent requires. *Cf. id.* at 318 ("The linear actuator in Figure 10 is depicted as structure **80**, and the flexible tape is considered a separate structure **82**. Accordingly, what Plaintiff calls a 'converted end linear actuator' is comprised of two separate structures—the actuator *and* the tape, not one integrated structure.").

Moreover, Ross-Hime does not explain Mr. Neils' substitution of the word "bendable" for "rotatable." In his reply report, Mr. Neils reasons that "[a]ll the claims require is that the rotation joints used permit the attached members to change their angular relationships to one another." (Pl.'s Resp., Ex. 4 at 17). This opinion does not conform to the Court's claim construction, where it was determined that "[t]he '580 Patent only includes language to suggest that structures 'rotatably connected' to the ends of the linear actuator are capable of rotating around the end of the linear actuator." *Ross-Hime Designs*, 126 Fed. Cl. at 317. The Court rejected Ross-Hime's invitation to construe the term linear actuator as including "circular movement of the structures rotatably attached to the actuator," reasoning that the additional language would render the "rotatably connected" and "capable of rotating" language redundant. *Id.* Mr. Neils' opinion that the tendons can be considered the "rotatable connection" because they

are capable of "bending," contravenes the Court's claim construction by equating the circular "bending" motion of the tendon with a "rotatable connection." *Id.*; *see also Phonometrics, Inc. v. N. Telecom Inc.*, 133 F.3d 1459, 1465 (Fed. Cir. 1998) ("A word or phrase used consistently throughout a claim should be interpreted consistently."). Thus, Ross-Hime's assertion that the tendon itself can be considered the rotatable connection between the linear actuator and finger segment is without merit.

Finally, Mr. Neils argues that there must be a rotatable connection between the linear actuator and finger segment because, if such a connection was absent, "neither the finger segments nor the hand could change their angular positions with respect to the straight line motions direction of the linear actuators." (Pl.'s Resp. at 13, Ex. 4 at 21). Mr. Neils admits that "[t]he linear actuators in [Robonaut 2] are indeed fixedly attached to lower arm **24**," but proclaims this "immaterial to the operation of the finger segments." (Pl.'s Resp. at 13, Ex. 4 at 21). Mr. Neils reasons this is so "because the reaction forces to the pulling of the tendons are carried back from the hand by the conduits surrounding the tendons through [several structures] to the base pieces of the corresponding linear actuators, and to which these conduits are rotatably connected by being bendable." (Pl.'s Resp. at 13, Ex. 4 at 21).

This argument fails for the same reasons as the last, namely because Mr. Neils reads out of the claim the limitation that the extending end of the actuator be "rotatably connected to said first effector base at corresponding effector locations thereon." It is certainly true that the linear actuators force the fingers and thumb structures to move—in fact, the primary function of an actuator is converting some kind of power into motion—but Robonaut 2 does not infringe on Ross-Hime's patents simply because it contains linear actuators and these actuators cause the fingers to move. Rather, the linear actuators must be positioned and connected in the manner the '580 Patent requires; that is, positioned between, and rotatably connected to, a first frame extension on one end and a first effector base on the opposite end. Mr. Neils' opinion fails to identify where and how Robonaut 2 meets this limitation.

In its infringement claim chart, Ross-Hime identifies the base end of the linear actuators as simply "[base piece]," the "rotatabl[e] connection" as the "conduits" or tubes that protect the tendons, the "first frame extension" as the base members, which are the base structures of the fingers or "effectors," and the "corresponding extension connection locations thereon" as tension sensors. (Pl.'s Resp., Ex. 2-1 at 4). Ross-Hime relies on Mr. Neils' opinion that "the motors and connected drive mechanisms are commonly termed a 'linear actuator,'" with "the linear motion driving parts thereof forming the extending piece [and] the remaining parts of the arrangement forming the base piece." (Pl.'s Resp. at 12). Mr. Neils further states that "the actuators **26** are motors operatively connected to tendons." (*Id.*). Based on these statements, it would seem that Mr. Neils and Ross-Hime agree that the actuators **26** in Robonaut 2 form part of the "base piece" of the linear actuators. In fact, Mr. Neils and Ross-Hime concede that "[t]he linear actuators in [Robonaut 2] are indeed fixedly attached to lower arm **24**." (*Id.* at 13). However, Ross-Hime points to no evidence showing that the base pieces of the linear actuators are rotatably connected to a "first frame extension" as Claims 1, 5, 14, and 15 require. (*See id.* at 11–14).

The structures Ross-Hime identifies as the "rotatable connection," "first frame extension," and "corresponding effector locations," are all located beyond the distal end—*i.e.*, extending end—of the actuators. Logically, the linear actuators cannot be positioned between a first frame extension on one end and a first effector base on the extending end, as the '580 Patent

requires, if both the first frame extension and first effector base are located beyond the distal end of the actuators. Although Ross-Hime apparently agrees that Robonaut 2's linear actuators are wholly contained in and affixed to, the forearm structure,[12] it does not attempt to explain this disconnect. As such, Ross-Hime has failed to demonstrate a genuine dispute of material fact that would preclude summary judgment of non-infringement in favor of the United States as to the '580 Patent.

In sum, the United States carried its burden by stating Ross-Hime has no evidence of infringement of the '580 Patent by Robonaut 2 and pointing to the specific ways in which Robonaut 2 does not meet the claim limitations. *See Exigent Tech.*, 442 F.3d at 1309. In response, Ross-Hime has failed to come forward with "specific facts showing that there is a genuine issue for trial." *Matsushita Elec. Indus. Co.*, 475 U.S. at 586–87. The expert reports Ross-Hime relies on are flawed in that they contravene the Court's construction of the term "linear actuator," and Ross-Hime advances no argument about how Robonaut 2 meets the limitation requiring a "first pair of base linear actuators rotatably connected to a first frame extension at corresponding connection locations." *See Mas-Hamilton*, 156 F.3d at 1211 ("If even one limitation is missing or not met as claimed, there is no literal infringement"). Likewise, Ross-Hime presents no argument regarding its theory of infringement under the doctrine of equivalents. Therefore, summary judgment of non-infringement as to Claims 1, 5, 14, and 15 of the '580 Patent by Robonaut 2 is appropriate.

C. Infringement of the '962 Patent by Robonaut 2

Ross-Hime alleges that Robonaut 2 infringes on Independent Claims 11 and 14 of the '962 Patent. However, for the same reasons that Ross-Hime's contentions as to infringement of the '580 Patent failed, so too do its contentions as to infringement of '962 Patent Claims 11 and 14. The Court will address each claim in turn.

1. '962 Patent Claim 11

Independent Claim 11 recites a hand-like structure and teaches:

> **11.** An articulated manipulating system for mounting on a base in a robotic manipulator and capable of engaging selected objects, said system comprising:
>
> a subbase rotatably mounted on said base to have a single subbase rotation axis therethrough;
>
> a first linear actuator coupled at one end thereof to said base and coupled at an opposite end thereof to said subbase to be capable of rotating said subbase about said subbase rotation axis;
>
> a first effector base rotatably connected to said subbase to have a first effector rotation axis;

[12] As explained above, Ross-Hime does not advance any argument other than what it alleges is contained in its infringement claim charts and Mr. Neils' expert reports.

> a second linear actuator coupled at one end thereof to said subbase and coupled at an opposite end thereof to said first effector base to be capable of rotating said first effector base about said first effector rotation axis.

'962 Patent 27:9–27:23.

The United States argues that Robonaut 2 does not infringe on Claim 11 because Robonaut 2 does not contain "a first linear actuator coupled at one end thereof to said base and coupled at an opposite end thereof to said subbase . . ." or "a second linear actuator coupled at one end thereof to said subbase and coupled at an opposite end thereof to said first effector base . . .." (Def.'s Mot. at 15, 27–30). According to the United States, "because the entirety of each linear actuator is located in the forearm of [Robonaut 2], and fixedly connected to the forearm structure," "Plaintiff cannot show any 'coupling' between a linear actuator used in [Robonaut 2] and a finger or thumb segment." (*Id.* at 28). Further, the United States contends that Ross-Hime's infringement chart is flawed in that it identifies a structure that is separate from the linear actuator, the tension sensor, as the base piece of the linear actuator, in contravention of the Court's claim construction. (*Id.* at 29). In the alternative, the United States argues that the Wauer Patent, U.S. Patent No. 4,367,891, anticipates Claim 11 of the '962 Patent.[13]

In response, Ross-Hime again relies exclusively on Mr. Neils' expert reports and its infringement claim charts, and raises identical arguments to those raised concerning the '580 Patent. In particular, Ross-Hime relies on Mr. Neils' expert reports in which, after repeatedly stating that the tendons in Robonaut 2 are not part of the linear actuators, he opines that: (1) the straight line moving portion of the tendon is part of the linear actuator and the portion that is "bendable" is the rotatable connection; (2) the tendon itself can be considered the rotatable connection; and (3) that there must be a rotatable connection between these structures or else the finger segments could not move. (*See* Pl.'s Resp. at 14–17). Ross-Hime also relies on Mr. Neils' opinion that:

> There is no wording in claim 11 about linear actuators being connected to any of the base, subbase or first effector base. Rather, the linear actuators in claim 11 are only required to be coupled to these different bases. The Term 'coupled' has no limit on the number or kind of coupling elements in the coupling made.

(Pl.'s Resp. at 16 (quoting Ex. 4 at 29, ¶ 65) (internal citations omitted)).

These arguments fail to establish a genuine dispute of material fact as to infringement of the '962 Patent. To the extent Ross-Hime relies on Mr. Neils' expert reports, his opinions as to the infringement of '962 Patent Claim 11 by Robonaut 2 are flawed for the reasons explained *supra* in section III(B) of this opinion. In addition to the reasons explained above, Mr. Neils' opinion addresses whether the tendons in Robonaut 2 can be considered the rotatable connection between the linear actuators and first frame extension or first effector base. (*See* Pl.'s Resp. at 15) ("Considering a tendon with a straight line moving portion as part of a connected linear actuator and a bendable, or rotatable, portion as part of the apparatus of the rotatable connection of the extending piece to a moveable component fits fine with the Court's definition."). But

[13] As explained below, this argument is mooted by the Court's holding that Ross-Hime has failed to present evidence of infringement showing a genuine dispute of material fact for trial.

Claim 11 does not contain this limitation. *See* '962 Patent 27:9–27:23. Instead, Claim 11 requires the linear actuator to be coupled between a base and subbase and "capable of rotating said subbase about said subbase rotation axis." Thus, Mr. Neils' opinion in this regard fails to establish infringement of Claim 11 by Robonaut 2. Mr. Neils' semantics regarding a distinction between "connected" and "coupled," is equally unpersuasive. Even if this distinction were material, Mr. Neils and Ross-Hime still fail to identify where in Robonaut 2 a first linear actuator is coupled to a base and subbase on opposing ends, and where a second linear actuator is attached to a subbase and first effector base on opposing ends, as Claim 11 requires.

In its Infringement Claim Chart, Ross-Hime again identifies a multitude of structures as comprising the "first linear actuator." (*See* Pl.'s Resp., Ex. 3-1 at 2 (identifying: finger actuator assemblies **26**, actuator housing **38**, end cap **68**, splitter **72**, motors **34**, gear drives **36**, ball screws **50**, conduits **46**, tension sensors **48**, [base piece], ball nuts **52**, and tendon housings **62** [extending piece] as comprising the linear actuators)). In its brief, however, Ross-Hime states that Robonaut 2 "[has] linear actuators as designated by number **26** in the '941 Patent." (Pl.'s Resp. at 14). Ross-Hime concedes that "[t]he linear actuators in [Robonaut 2] are indeed fixedly attached to lower arm 24." (*Id.* at 16). It then identifies the tension sensor as the "coupling" between the "base piece" end of the linear actuator and "base," and the tendon terminator as the "coupling" between the "extending piece" end of the linear actuator and subbase. (Pl.'s Resp., Ex. 3-1 at 2–6). These arguments do not comport with the Court's construction of "linear actuator."

As explained above, the Court excluded separate structures, such as the tension sensor and tendon terminator, from the construction of the term "linear actuator." *Ross-Hime Designs*, 126 Fed. Cl. at 321. Moreover, the tension sensor and tendon terminator are both positioned beyond the distal end of the extending piece of Robonaut 2's linear actuators. Ross-Hime acknowledges that Robonaut 2's linear actuators are wholly contained in and affixed to, the forearm structure. Thus, the actuators cannot possibly be said to be coupled between the "base" on one end, and subbase on the opposing end, as Claim 11 requires. Ross-Hime does not attempt to explain this *non sequitur*. Moreover, Ross-Hime fails to advance any argument regarding its theory of infringement by Robonaut 2 under the doctrine of equivalents. As such, Ross-Hime has failed to point to evidence of infringement of Claim 11 by Robonaut 2 sufficient to withstand the United States' motion.

Although it is not necessary to discuss Robonaut 2's alleged infringement of Claim 11 any further, *see Mas-Hamilton*, 156 F.3d at 1211 ("[i]f even one limitation is missing or not met as claimed, there is no literal infringement"), Ross-Hime faces the same problem with respect to the last limitation in Claim 11 requiring "a second linear actuator coupled at one end thereof to said subbase and coupled at an opposite end thereof to said first effector base." The structures Ross-Hime identifies as the subbase and first effector base are also positioned beyond the distal end of the extending piece of Robonaut 2's linear actuators, which Ross-Hime agrees are located within the forearm. Consequently, Ross-Hime has failed to present evidence of infringement as to Claim 11 of the '962 Patent by Robonaut 2 that would preclude summary judgment.

In short, Ross-Hime cannot prove that at least one limitation of '962 Patent Claim 11 is met by Robonaut 2. As such, the United States is entitled to summary judgment of non-infringement as to this claim. RCFC 56(a); *see Mas-Hamilton*, 156 F.3d at 1211 ("If even one limitation is missing or not met as claimed, there is no literal infringement."). In light of this

holding, the United States' alternative argument that the Wauer Patent anticipates each and every element of Claim 11 of the '962 Patent, is moot.

2. '962 Patent Claim 14

Independent Claim 14 recites a human thumb-like structure and teaches:

> **14.** An articulated manipulating system for mounting on a base in a robotic manipulator and capable of engaging selected objects, said system comprising:
>
> a plurality of shackles each having a pair of arms spaced apart by a recess space with said arms being joined in a joining structure on one side of said recess space;
>
> a plurality of effector bases each rotatably mounted at a pivot location thereof to and between said separate arms of a corresponding shackle so as to leave a recess space between an end of that said effector base rotatably mounted to said shackle and said joining structure thereof;
>
> a fixed pedestal affixed to said base and having said joining structure of a corresponding one of said plurality of shackles rotatably coupled thereto;
>
> a moveable pedestal rotatably connected to said base and having said joining structure of a corresponding one of said plurality of shackles rotatably coupled thereto;
>
> a pedestal linear actuator coupled at one end thereof to said base and coupled at an opposite end thereof to said moveable pedestal to be capable of rotating said moveable pedestal with respect to said base.

'962 Patent 27:56–28:10.

Focusing predominantly on the last limitation in Claim 14, the United States argues that Robonaut 2 does not have "a pedestal linear actuator coupled at one end thereof to said base and coupled at an opposite end thereof to said moveable pedestal to be capable of rotating said moveable pedestal with respect to said base." (Def.'s Mot. at 30). The United States repeats that the entirety of each linear actuator in Robonaut 2 is located within and connected to the forearm structure, and that the extending piece of each actuator is connected to tendons, which are separate structures under the Court's claim construction. (*Id.*). As such, it contends that Ross-Hime cannot show any coupling between a pedestal linear actuator and a finger or thumb segment. Furthermore, because the "base piece" of each actuator, as described in the Court's claim construction, is located in and affixed to the Robonaut 2 forearm, the United States argues that "there is no 'coupling' of the 'base piece' of the finger and thumb linear actuators in [Robonaut 2] to a 'base' that, in turn, is rotatably connected to a 'moveable pedestal,' as is required in '962 Claim 14." (Def.'s Mot. at 31). Finally, the United States maintains that Ross-Hime's infringement claim chart as to Claim 14 is flawed for the same reasons that its claim chart as to Claim 11 was flawed: it "identifies the tension sensor—a structure that is separate from the linear actuator—as the base piece of the linear actuator and fails to show how the identified linear actuator 'extending piece' is coupled to what it identifies as the moveable pedestal." (*Id.*).

Ross-Hime, again relying solely on Mr. Neils' expert reports and, apparently, its infringement claim charts,[14] notes that Mr. Neils "specifically opined [that Robonaut 2] does *literally* have linear actuators as described in Claim 14." (Pl.'s Resp. at 18). Based on this reference, the Court understands Ross-Hime to be arguing literal infringement only, and not infringement under the doctrine of equivalents.[15] According to Ross-Hime's brief, Robonaut 2's linear actuators are "designated by number **26** in the '941 Patent,"[16] and "base structure **34**, or the palm, of hand **18** as the claim base, and phalange **38A**, or the thumb segment, as the movable pedestal of the claim." (Pl.'s Resp. at 18). Ross-Hime argues that, according to Mr. Neils, because the '941 Patent shows a tendon **90E** connected to phalange **38A**, and is used to open pitch joint **42B**, Robonaut 2 contains "a pedestal linear actuator coupled at one end thereof to said base and coupled at an opposite end thereof to said moveable pedestal," as Claim 14 requires.

In its Reply, the United States explains that Mr. Neils' understanding of the '941 Patent is incorrect. (Def.'s Reply at 11). The Court agrees. The '941 Patent provides: "Joint **42B** rotatably mounts phalange **38B** to phalange **38A** such that phalange **38B** is selectively rotatable with respect to phalange **38A** about axis **A2**." '941 Patent 4:41–42. Figures 11 and 12 clearly show that tendon **90E** is connected to phalange **38B** rather than phalange **38A**:

[14] Despite stating that "The Government's position is incorrect, because the Government has avoided using Plaintiff's claim chart evidence, which establishes infringement, and for the reasons that follow," Ross-Hime proceeds to rely exclusively on Mr. Neils' expert reply report, which is copied verbatim and without quotation marks or other indication of where Mr. Neils' opinions end and Ross-Hime's arguments begin. Ross-Hime does not include a single citation or reference to its infringement claim charts.

[15] As explained above, Ross-Hime does not mention the doctrine of equivalents anywhere in its brief.

[16] The identification of Robonaut 2's linear actuators in Ross-Hime's brief is different than what is stated in its infringement claim chart. (*See* Pl.'s Resp., Ex. 3-1 at 17 (citing the '903 Patent and identifying the linear actuators as being comprised of: finger actuator assemblies 26, actuator housing **38**, end cap **68**, splitter **72**, motors **34**, gear drives **36**, ball screws **50**, conduits **46**, tension sensors **48**, [base piece], ball nuts **52**, and tendon housings **62** [extending piece])).

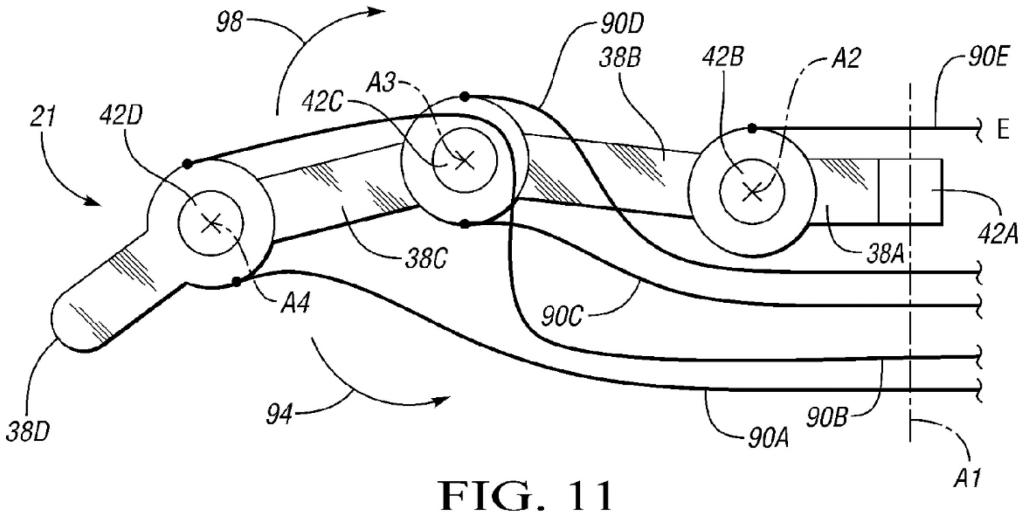

FIG. 11

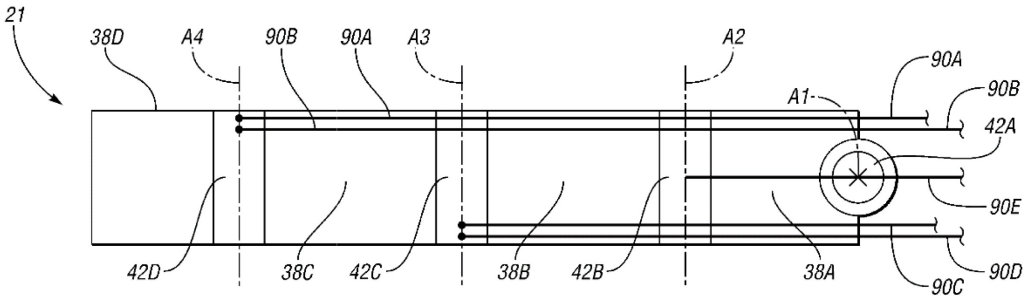

FIG. 12

'941 Patent, Figs. 11, 12 (Def.'s Mot., Ex. P).

In fact, contrary to Mr. Neils' arguments, Figures 11 and 12 do not show any tendon connected to phalange **38A**. The specification explains that tendon **90E** is connected to phalange 38B, while the other four tendons, **90A–90D** are connected to phalanges **38C** and **38D**. '941 Patent 6:17–7:5. Thus, the '941 Patent does not describe any tendon as being connected to phalange **38A**, as Mr. Neils claims. Consequently, Mr. Neils' opinion in this regard is flawed and provides no support for Ross-Hime's contentions. As Ross-Hime relies solely on this opinion in response to the United States' motion, Ross-Hime has pointed to no evidence that establishes a genuine dispute of material fact exists for trial.

To the extent that Mr. Neils impliedly advances an argument under the doctrine of equivalents by opining the thumb links "must be rotatably connected to [the] actuator extending piece ends" because "those links can have their angular relationships changed with respect to the

linear actuator extending piece straight line moving direction," (Pl.'s Reply at 18),[17] the Court is unpersuaded. The Court has explained that structures connected to the ends of linear actuators are not part of the linear actuator. There is no dispute that the linear actuators in Robonaut 2 cause the finger segments to move. Actuators convert power into motion. *Ross-Hime Designs*, 126 Fed. Cl. at 315. Thus, if the existence of a linear actuator and moveable parts in a device were sufficient to prove infringement of Ross-Hime's patents, every device that contained a linear actuator and had moveable parts would infringe. *See Perkin–Elmer Corp.*, 822 F.2d at 1532 ("a court may not, under the guise of applying the doctrine of equivalents, erase a plethora of meaningful structural and functional limitations of the claim on which the public is entitled to rely in avoiding infringement.").

Therefore, as the United States has carried its burden of pointing to specific ways in which the accused device does not meet the claim limitations, and Ross-Hime has failed to establish a genuine dispute of material fact as to infringement of Claim 14 by Robonaut 2, summary judgment in favor of the United States must be granted.

C. Ancillary Issues

Several other issues were raised in the parties' briefs that should be addressed. First is the issue of the timing and sufficiency of Ross-Hime's infringement claim charts and the United States' failure to provide Ross-Hime with a non-infringement claim chart. (*See* Def.'s Mot. at 6–8; Pl.'s Resp. at 6 n.1; Def.'s Reply at 15). The United States argues that Ross-Hime's updated "final" infringement claim chart should be excluded because it was served nearly two months after the March 14, 2017 deadline for Ross-Hime to provide its "[f]inal disclosure of asserted claims and claim charts," established in the Court's Third Amended Scheduling Order, (ECF No. 229). In response, Ross-Hime blames the United States for this, explaining "Defendant's counsel in submitting revised scheduling orders to the Court, mistakenly dropped the deadline for Plaintiff submitting its amended claim chart." (Pl.'s Resp. at 6 n.1). However, the United States did not base any arguments in its motion for summary judgment on "amended" portions of Ross-Hime's claim charts. For this reason, and given the Court's holding above, the issue is moot.

Second, Ross-Hime alleges that the United States' position in its motion for summary judgment is contradicted by its discovery admissions. (Pl.'s Resp. at 10, 19–20). Ross-Hime claims that the United States cannot rely on Defendant's Exhibits I and L as evidence of the operation of Robonauts 1 and 2 because, in its discovery responses, the United States denied that the descriptions in Exhibits I and L accurately reflected the finger actuation systems in the Robonauts. (Pl.'s Resp. at 10, 19–20). In response, the United States notes its numerous, recurring objections to Ross-Hime's request for admissions regarding these exhibits. (Def.'s Reply at 14–15). As the United States correctly observes, Ross-Hime provides "no authority to support its assertion that the responses to improper requests should cause Exhibits I and L to be excluded from evidence." (*Id.* at 15). Ross-Hime was free, as it did, to point out any perceived

[17] Such a characterization is generous considering Mr. Neils' reply report contains an entire subsection dedicated to infringement of Robonaut 2 under the doctrine of equivalents, (*See* Pl.'s Resp., Ex. 4 at 23–25), but the quoted language does not appear in that section of his reply report. And, as far as the Court can discern, Ross-Hime does not cite to this section to support its arguments. It does not appear that Mr. Neils addressed the doctrine of equivalents as to Robonaut 1 in his reply report.

contradiction in the United States' argument but this does not mean the contradictory statements or evidence must be excluded. Ross-Hime cites no authority for this contention and it is not the role of the Court to find support where none is provided.

Third, Ross-Hime argues the United States' motion for summary judgment must be denied because "[t]he Government has submitted no sworn testimony by its engineers or expert to describe the operation of the [Robonaut 2] finger and thumb linear actuators." (Pl.'s Resp. at 10, 19–20). Ross-Hime quotes from RCFC 56(c)(1)(A) to argue that the United States was required to support its motion with "depositions, documents, [ESI], affidavits, stipulations, admissions, interrogatory answers, or other materials." (*Id.*). However, if Ross-Hime had read all of RCFC 56(c)(1), it would have discovered that subsections (A) and (B) are separated by an "or." The entire provision reads:

> A party asserting that a fact cannot be or is genuinely disputed must support the assertion by:
>
> (A) citing to particular parts of materials in the record, including depositions, documents, electronically stored information, affidavits or declarations, stipulations (including those made for purposes of the motion only), admissions, interrogatory answers, or other materials; **or**
>
> (B) showing that the materials cited do not establish the absence or presence of a genuine dispute, or that an adverse party cannot produce admissible evidence to support the fact.

RCFC 56(c)(1) (emphasis added).

As explained in detail above, the United States' motion was properly supported under RCFC 56(c)(1)(B) because it pointed to the absence of evidence to support Ross-Hime's infringement contentions and pointed to the specific ways in which the Robonauts did not meet the claim limitations. (*See* Def.'s Mot. at 4–6 (setting forth applicable legal standards and quoting numerous cases interpreting the summary judgment standard)). Thus, Ross-Hime's argument in this regard is meritless.

Finally, in addition to its motion for summary judgment, the United States also filed a motion *in limine* to exclude the testimony and reports of Ross-Hime's expert, Mr. Theodore Neils, at trial. (Def.'s Mot. in Lim., ECF No. 318). However, based on the Court's holdings above, this issue is moot.

IV. Conclusion

The United States has carried its burden under RCFC 56 of showing the absence of proof concerning the alleged infringement of '580 Patent Claims 1, 5, 14, and 15 and '962 Patent Claims 11 and 14 by Robonaut 1 and Robonaut 2. In response, Ross-Hime has failed to point to specific facts showing a genuine dispute of material fact for trial. As such, the United States' motion for summary judgment of non-infringement as to all disputed claims is hereby **GRANTED**. In light of this holding, the United States' alternative argument regarding invalidity of '962 Patent Claim 11 is **DENIED AS MOOT**. Specifically, the United States' motion is:

- **GRANTED** as to alleged infringement of '580 Patent Claim 5 by Robonaut 1;

- **GRANTED** as to alleged infringement of '580 Patent Claims 1, 5, 14, and 15 by Robonaut 2;
- **GRANTED** as to alleged infringement of '962 Patent Claim 11 by Robonaut 2;
- **GRANTED** as to alleged infringement of '962 Patent Claim 14 by Robonaut 2; and
- **DENIED AS MOOT** as to the United States' invalidity argument of '962 Patent Claim 11.

Finally, in light of these holdings, the United States' Motion *in Limine*, (ECF No. 318), is **DENIED AS MOOT**.

The parties are directed to file proposed redactions to this opinion **within 14 days of the date of this decision**.[18] The Clerk is directed to enter judgment accordingly. Each side shall bear its own costs.

IT IS SO ORDERED.

s/ David A. Tapp
DAVID A. TAPP, Judge

[18] The parties did not propose any redactions to this opinion. Therefore, the Court has reissued the opinion in its entirety.